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| 10/716,386 | 11/18/2003 | Nilanjan Mukherjee | 2003P54686 US | 4414 |

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| EXAMINER | |
|---|---|
| DAY, HERNG DER | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/716,386 | MUKHERJEE, NILANJAN | |
| | Examiner | Art Unit | |
| | HERNG-DER DAY | 2128 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *10 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-4,6-9 and 11-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-9 and 11-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 April 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/16/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

**1.** This communication is in response to Applicant's Amendment and Response ("Amendment") to Office Action dated January 8, 2007, mailed April 4, 2007, and received by PTO April 10, 2007.

**1-1.** The instant application was abandoned on July 2, 2007, for failure to timely notify the U.S. Patent and Trademark (USPTO) of the filing of an application in a foreign country. Applicant filed a renewed petition on August 4, 2008, to revive the instant application. The renewed petition has been granted on March 11, 2009.

**1-2.** Claims 1, 6, and 11 have been amended. Claims 5, 10, and 15 have been canceled. Claims 1-4, 6-9, and 11-14 are pending.

**1-3.** Claims 1-4, 6-9, and 11-14 have been examined and rejected.

### *Information Disclosure Statement*

**2.** The information disclosure statement filed April 16, 2007, fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. Cited document No. BH has no publication date. Therefore, it has been placed in the application file, but the information referred to therein has not been considered.

***Drawings***

**3.** The replacement drawing sheets received on April 10, 2007, incorporating the proposed drawing corrections to Figure 13 and Figure 14 are acceptable. The objection to the drawings has been withdrawn.

***Specification***

**4.** All the amended paragraphs are approved. The objections to the specification have been withdrawn.

***Claim Rejections - 35 USC § 112***

**5.** The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

**6.** Claims 1-4, 6-9, and 11-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

**6-1.** Independent claim 1 recites the amended limitation, "loading, in a data processing system, *a model having a plurality of nodes*" in lines 2-3 of the claim without reciting further limitations regarding the "model" or the "nodes". In other words, the loaded model may only have a plurality of nodes without any connection between the recited *a plurality of nodes*. Therefore, the limitations of "determining a nodal valency of the selected node" and "determining an element connectivity pattern of the selected node", as recited in lines 5-6 of the claim, are vague and indefinite because it is unclear how these steps may be performed for the

selected node in such a model having nodes only. It is also unclear how to "performing a smoothing operation on the selected node according to the nodal valency and the element connectivity pattern", as recited in lines 7-8 of the claim, because it is unclear how "the nodal valency and the element connectivity pattern" may be determined as discussed above. Clarification of the metes and bounds, via clearer claim language, is requested.

**6-2.** Independent claims 6 and 11 recite the equivalent method limitations as in claim 1 and are rejected for the same reason. All dependent claims are rejected as being dependent on a rejected claim.

### *Claim Rejections - 35 USC § 101*

**7.** 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

**8.** Claims 1-15 are rejected under 35 U.S.C. 101 because the inventions as disclosed in claims are directed to non-statutory subject matter.

**8-1.** Claims 1-15 are directed to smoothing a node. This claimed subject matter lacks a practical application of an abstract idea.

Specifically, the claimed subject matter fails to sufficiently reflect at least one practical utility set forth in the descriptive portion of the specification. More specifically, while the described practical utility is directed to smoothing a node for a hybrid, variational, user-controlled, 3D mesh smoothing algorithm for orphaned shell meshes the claimed subject matter relates ONLY to a model having a plurality of nodes. Consequently, the limitations of "determining a nodal valency of the selected node" and "determining an element connectivity

pattern of the selected node", as recited in each independent claim, are indefinite because it is unclear how these steps may be performed for the selected node in such a model having nodes only as detailed in paragraph **6-1** above. In other words, the claimed subject matter including the recited "performing a smoothing operation on the selected node according to the nodal valency and the element connectivity pattern" as a whole is only an abstract mathematical concept without providing evidence that the abstract idea has been practically applied.

***Claim Rejections - 35 USC § 102***

**9.** The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**10.** Claims 1-4, 6-9, and 11-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Blacker, U.S. Patent 5,315,537 issued May 24, 1994 (IDS 1, filed June 24, 2004).

**10-1.** Regarding claim 1, Blacker discloses a method for smoothing, comprising:

loading, in a data processing system, a model having a plurality of nodes (the generated quadrilateral mesh representation of the geometric region as illustrated in FIGS. 12(A)-12(D), column 6, lines 11-13);

receiving a selection of a node of the model (The paving boundary smooth step 131 … is limited to nodes on the current paving boundary that are not part of the permanent boundary. … Defining $V_i$ as a vector from the origin to a *node* $N_i$ and assuming that $N_i$ is attached to n elements, column 12, lines 30-42);

determining a nodal valency of the selected node (FIG. 12(b), $N_i$ is attached to n elements, column 12, lines 39-42);

determining an element connectivity pattern of the selected node (quadrilateral element, FIG. 12(b); the generated *quadrilateral mesh representation* of the geometric region as illustrated in FIGS. 12(A)-12(D), column 6, lines 11-13);

performing a smoothing operation on the selected node according to the nodal valency and the element connectivity pattern (paving boundary smooth step 131, column 12, lines 30-68); and

storing the model (the generated quadrilateral mesh representation of the geometric region, column 6, lines 11-13; stored at least in the RAM).

**10-2.** Regarding claim 2, Blacker further discloses wherein

if the element connectivity pattern is a triangle, then incenter-based smoothing is performed;

if the element connectivity pattern is a quad-only mesh (a mesh of *all quadrilateral elements* for a geometric region of an arbitrary geometry, column 5, lines 43-46), then isoparametric-Laplace smoothing is performed (a modified isoparametric smooth, column 12, lines 30-33; A modified length-weighted Laplacian smoother is used, column 14, lines 1-5);

if the element connectivity pattern is a mapped region, then equipotential smoothing is performed; and

if the element connectivity pattern is a free-mixed mesh, then combined incenter and laplacian smoothing is performed.

**10-3.** Regarding claim 3, Blacker further discloses wherein the smoothing of the node is performed using

$$Pi' = \sum_{n=1}^{N} Fn(C,V) * \Omega n\ (C,V)$$

and wherein i is the node to be smoothed, i is connected to N elements, Pi' is the new position of node i, Fn is the variational weight factor for n-th element Ωn is the positional function for n-th element, C denotes the connectivity pattern of the node, and V indicates the valency of the node (column 12, equation [19]).

**10-4.** Regarding claim 4, Blacker further discloses comprising performing an interior angle screening process (If the expansion ratio and interior angle are both greater than threshold values, column 16, lines 10-14).

**10-5.** Regarding claims 6-9, these system claims include equivalent method limitations as in claims 1-4 and are anticipated using the same analysis of claims 1-4.

**10-6.** Regarding claims 11-14, these computer program product claims include equivalent method limitations as in claims 1-4 and are anticipated using the same analysis of claims 1-4.

### *Applicant's Arguments*

**11.** Applicant argues the following:

**11-1.** CLAIM REJECTION UNDER 35 U.S.C. § 112

(1) Claims 5, 10, and 15 were rejected under 35 U.S.C. § 112, first paragraph. "These claims are cancelled, and the rejection is believed moot." (Page 10, paragraph 1, Amendment)

(2) "Claims 6-15 were rejected under 35 U.S.C. § 112, second paragraph. "These rejections are believed moot in light of the claim amendments above, and are traversed." (Page 10, paragraph 2, Amendment)

**11-2.** CLAIM REJECTION UNDER 35 U.S.C. §101

(3) Claims 1-15 were rejected as drawn to non-statutory subject matter. "The independent claims are amended above to accommodate the Examiner's concern, and these rejections are believed obviated and are therefore traversed." (Page 10, paragraph 4, Amendment)

**11-3.** CLAIM REJECTION UNDER 35 U.S.C. §102

(4) "As can be seen, nothing in this passage teaches or suggests a selection of a node of the model, or that a selection is received by anything. As such, Blacker does not meet the limitations of the claims." (Page 12, paragraph 2, Amendment)

(5) "As can be seen, nothing at all in these figures, the accompanying description, or anything else in Blacker teaches or suggests determining the nodal valency of any node. As such, Blacker cannot anticipate the claims." (Page 13, paragraph 2, Amendment)

(6) "While the relevant passages describe rows of quadrilateral elements, nothing in Blacker teaches or suggests determining an element connectivity pattern of the selected node, as claims. As such, Blacker cannot anticipate the claims." (Page 13, paragraph 3, Amendment)

(7) "As Blacker does not teach or suggest anything related to nodal valency or element connectivity patterns, any smoothing performed by Blacker is not done according to the nodal valency and the element connectivity pattern, as claimed. As such, Blacker cannot anticipate the claims." (Page 13, paragraph 4, through page 14, paragraph 1, Amendment)

(8) "All independent claims have similar limitations not taught or suggested by the art of reference, and so all claims distinguish over all cited art. All rejections are traversed." (Page 14, paragraph 2, Amendment)

***Response to Arguments***

**12.** Applicant's arguments have been fully considered.

**12-1.** Applicant's argument (1) is persuasive. The rejections of claims 5, 10, and 15 under 35 U.S.C. 112, first paragraph, in Office Action dated January 8, 2007, have been withdrawn.

**12-2.** Applicant's argument (2) is persuasive. The rejections of claims 6-15 under 35 U.S.C. 112, second paragraph, in Office Action dated January 8, 2007, have been withdrawn.

**12-3.** Applicant's argument (3) is not persuasive because the claimed subject matter lacks a practical application of an abstract idea as detailed in paragraph **8-1** above.

**12-4.** Applicant's argument (4) is not persuasive. Blacker discloses in column 12, lines 30-33, "The paving boundary smooth step 131 ... is limited to nodes on the current paving boundary that are not part of the permanent boundary." In other words, any node of the nodes on the current paving boundary that are not part of the permanent boundary may be selected for smoothing. Blacker further discloses in column 12, lines 39-42, "Defining $V_i$ as a vector from the origin to a *node* $N_i$ and assuming that $N_i$ is attached to n elements". In other words, a specific *node* $N_i$ is selected for smoothing using equation [19], which anticipates the argued limitation.

**12-5.** Applicant's arguments (5) - (8) are not persuasive. Blacker discloses in column 6, lines 11-13, "The finite element analysis uses the *generated* quadrilateral mesh representation of the geometric region as illustrated in FIGS. 12(A)-12(D)." In other words, FIGS. 12(A)-12(D) are the *generated quadrilateral mesh representations* of the geometric region. Each figure, for example, 12(B), represents a *quadrilateral mesh* model having a plurality of nodes. Therefore, the nodal valency and the element connectivity pattern of any selected node in the model can be determined from the figure. Furthermore, Blacker discloses in column 12, lines 39-42, "Defining $V_i$ as a vector from the origin to a *node* $N_i$ and assuming that $N_i$ is attached to n

elements, $V_{mj}$, $V_{mk}$ and $V_{ml}$ are vectors from the origin to nodes $N_j$, $N_k$ and $N_l$ of the $m^{th}$ element, respectively." In other words, the nodal valency of the selected *node $N_i$* is specifically determined to be *n* elements and each $m^{th}$ element is a *quadrilateral* element having $N_i$, $N_j$, $N_k$, and $N_l$ four nodes. Finally, smoothing for *node $N_i$* is performed using equation [19] according to the nodal valency (i.e., n) and the element connectivity pattern (i.e., $V_{mj}$, $V_{mk}$ and $V_{ml}$), which anticipates the argued limitations.

***Conclusion***

**13.** Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

**14.** Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Herng-der Day whose telephone number is (571) 272-3777. The Examiner can normally be reached on 9:00 - 17:30.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: (571) 272-2100.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kamini S. Shah can be reached on (571) 272-2279. The fax phone numbers for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Herng-der Day/
Examiner, Art Unit 2128

August 10, 2010

/Hugh Jones/
Primary Examiner, Art Unit 2128